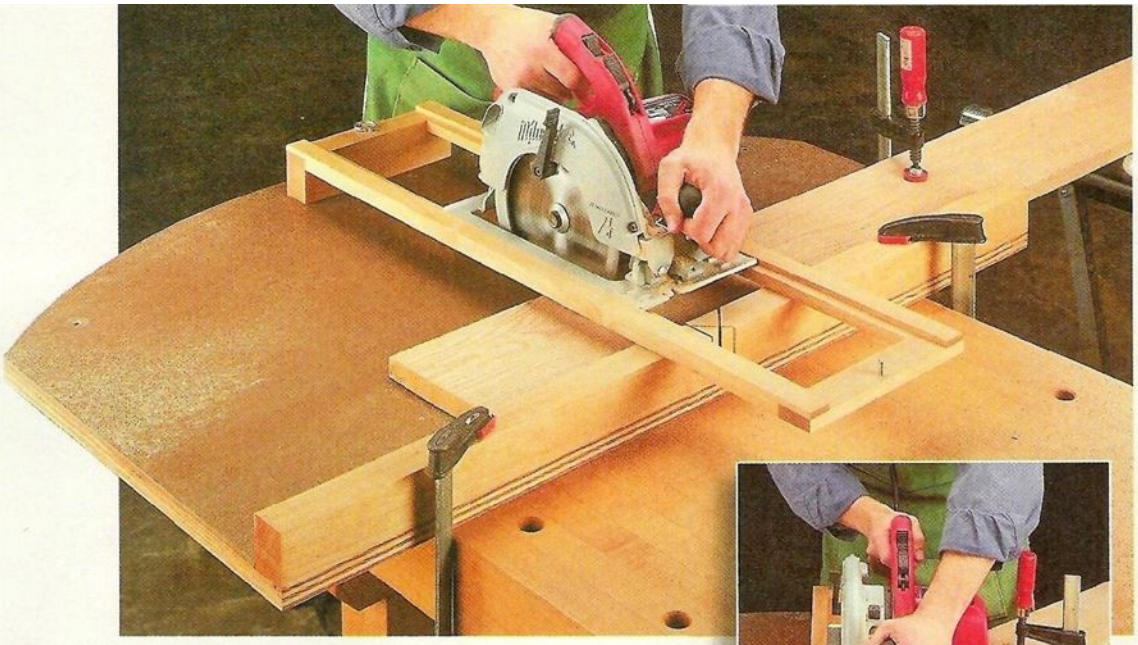

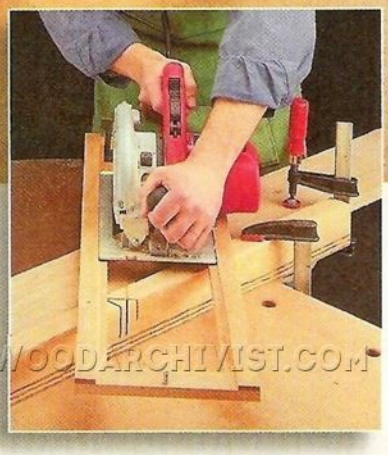

Circular Saw Miter Station

Get precise miters and crosscuts from your circular saw every time!

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When was the last time you used a portable circular saw to cut a perfect miter or make an exact 90° crosscut? For me, the answer is almost never — that is, until I built this miter station (see photo above).

To ensure accurate results, this station automatically positions the saw at 45° or 90° to the edge of a board. Even more important, it has a built-in guide that keeps you cutting in a straight line.

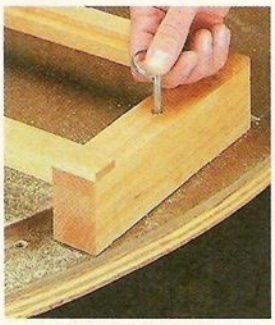
Platform and Carriage – This project consists of two parts. The first is a platform with a fence that's used to position a board under the saw. The other part is a long, open frame that forms a carriage which guides the saw. To get the carriage to the desired angle, it pivots on a steel pin that fits into the fence (see inset photo).

Indexing System – One great feature of this project is how easily you can set up to make a cut at a 90° or 45° angle. A simple indexing system locks the carriage in exactly the right place. Just pivot the carriage into position and push an index pin through the carriage until it drops into a hole in the platform (see left photo below). Bronze bushings line each hole to keep the holes from wearing with use.

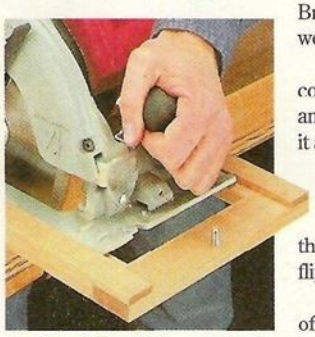
The stops make it quick and easy to cut the most common angles. But you can cut any angle between 45° and 90° by just positioning the carriage where you need it and clamping it in place.

Stop – At the end of a cut, the saw's travel is stopped by a metal pin that sticks up at the end of the carriage (right photo). This keeps you from pushing the saw too far and having the back end of the carriage flip up. When the saw hits the stop, the cut is done.

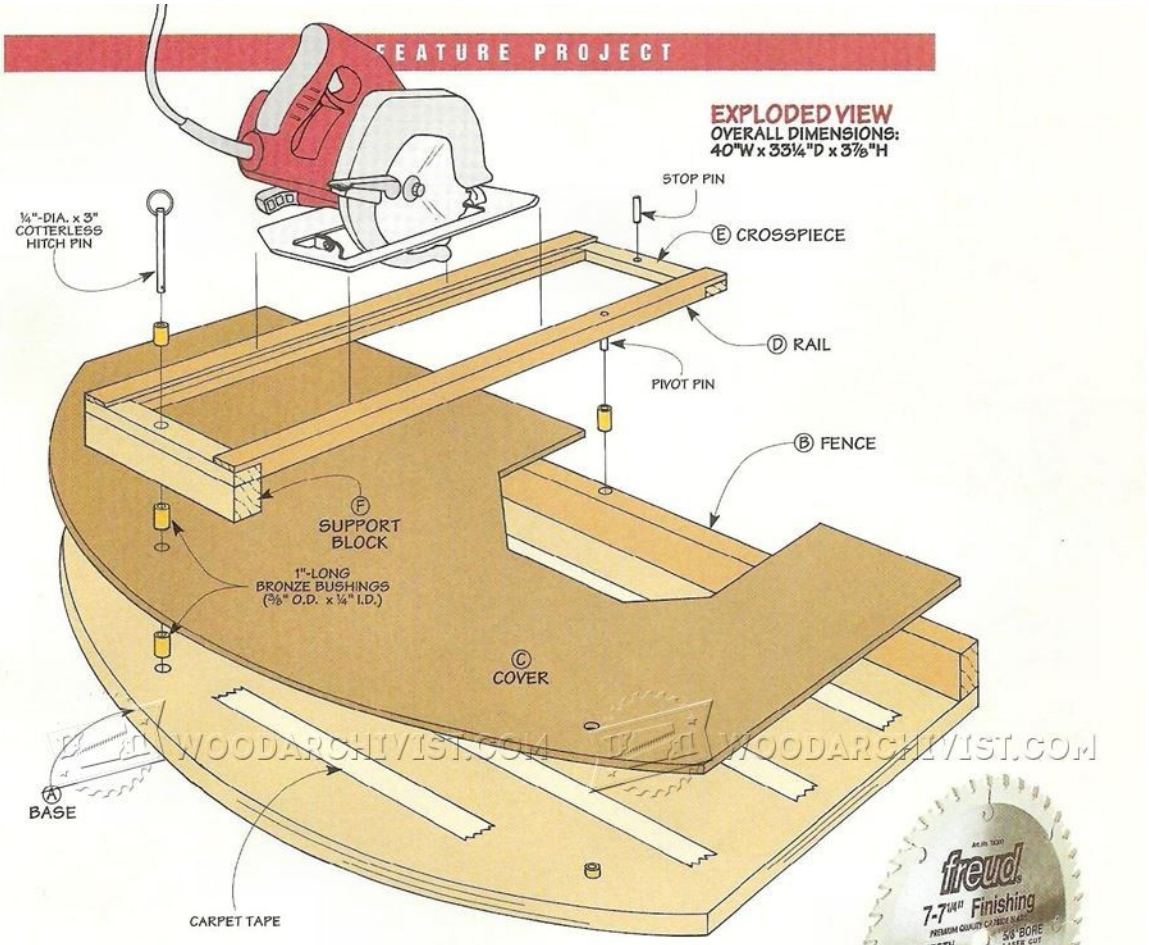
Replaceable Top – The top of the platform is a piece of hardboard that can be removed and replaced if it begins to wear. It's held down with double-sided carpet tape so that it stays put while the station is being used (see the photo on page 21).



▲ *Index Pin. A metal pin locks the saw carriage in place for precise cuts every time.*



▲ *Stop Pin. At the end of a cut, the saw is stopped by a pin in the carriage.*



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Materials

Platform	
A Base (1)	28 x 40 - ¾ Ply.
B Fence (1)	1½ x 17⅞ - 40
C Cover (1)	26½ x 40 - ¼ Hdbd.
Saw Carriage	
D Rails (2)	¾ x 1½ - 32
E Crosspcs. (2)	½ x 1½ - 8⅝ (rgh.)
F Sprt. Blk. (1)	1½ x 1⅝ - 8⅝ (rgh.)

Hardware

- (2) ¼" x 2½" Hex Head Bolts
- (6) ⅜" O.D. x ¼" I.D. - 1" Bronze Bushings
- (1) ¼"-dia. x 3" Cotterless Hitch Pin

Saw Tune-up

Building this miter station does wonders for improving the accuracy of the crosscuts and miters you can make with your circular saw. But there are a couple of other things you can do that will improve the final fit and finish of the cut surface.

In addition to cutting an angle accurately, it's just as important that the cut be as clean as possible. For a cut with a satin-smooth surface, choose a high-quality crosscut blade.

I found a 40-tooth, carbide-tipped blade at a local home center (see photo above). It was pricier than any other blade I've bought for my circular saw (about $22), but judging by the quality of the cuts, it was well worth it.

Once the blade is installed, make sure the base of the saw is perfectly square to the blade, as shown in the photo at left. When you do this, make sure you set the blade of the square against the body of the saw blade, and not against a tooth.

Platform & Carriage

▲ *Installing Bronze Bushings. To get a bushing into a hole without damaging the bushing, I press it in with a C-clamp.*

The platform of the circular saw miter station provides a flat, stable surface with a fence for aligning the workpiece. It also supports the carriage that the saw rides on.

Base – The platform starts out with a rectangular *base (A)* made of ¾" plywood (Figure 2).

Fence – Next, a hardwood fence is added along one edge of the base. The fence aligns the workpiece on the platform and supports one end of the carriage. The *fence (B)* is cut to the same length as the base. I cut mine from 1½"-thick stock, but it could also be made from two pieces of ¾" stock glued together.

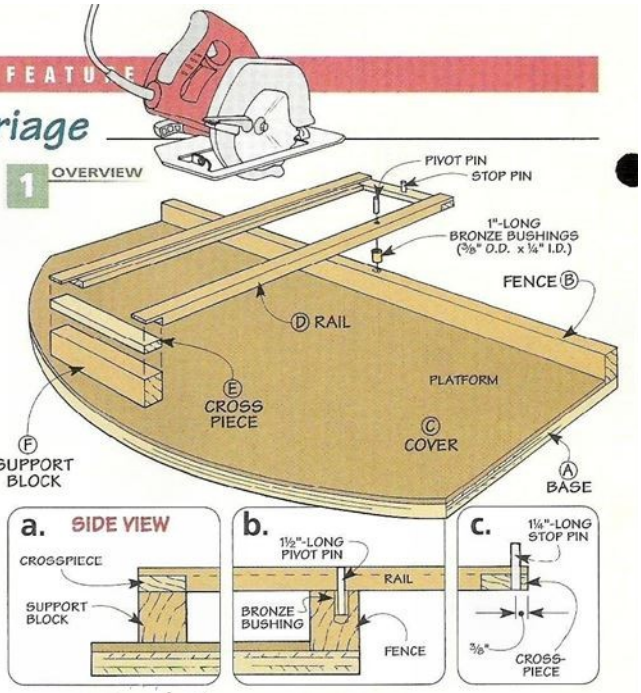
Later, after the carriage is built, the carriage is attached to the fence by a short steel pin that fits into a bushing in the fence. So after the fence is glued in place, a hole is drilled for the bushing.

If you take a look at Figure 2, you'll see this hole is 17⅝" from one end of the fence — which end depends on your saw. If your circular saw's blade is on the right side of the saw (like mine), measure from the right end of the fence. If the blade is on the left side of the saw, measure from the left end of the fence.

Once the hole is drilled, a bronze bushing is pressed into it. This bushing prevents the pivot pin from enlarging the hole. Driving the bushing in with a hammer could damage the bushing's top edge. As you can see in the margin, the solution is to use a C-clamp.

Cover – To complete the platform, a hardboard *cover (C)* is added to the base. The cover is the same length as the base, but it's 1½" narrower to allow for the fence.

The cover is meant to be replaced when it gets chewed up. For this reason, it's held down only with double-sided carpet tape, as you can see in Figure 2. When the cover is in place, the ends can be sanded flush with the base. Don't worry about sanding the front edge, as it will be cut to shape later.

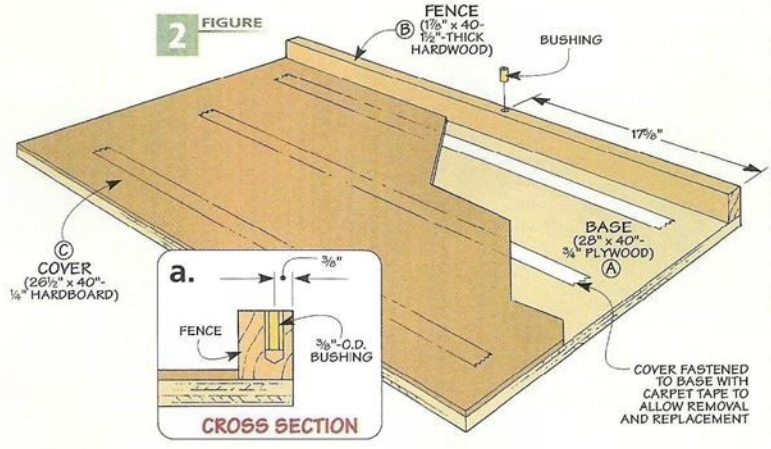


SAW CARRIAGE

The second part of the miter station is the saw carriage. This is a rectangular wood frame that guides the circular saw (Figure 1). A steel pin in one rail serves as the pivot point for the carriage. A second pin sticks up at the far end of the carriage to act as a stop for the saw at the end of a cut.

Rails – The *rails (D)* are long, narrow pieces of ¾"-thick hardwood. Take a look at Figure 3 and you'll see that a notch needs to be cut in each end of the rails to accept the cross pieces that "tie" the carriage together. And a rabbet along the inside edge of each rail creates a lip that guides the metal base of the saw.

I cut the notches on the ends of the rails first, using a dado blade in the table saw. To do this, position the table saw rip fence 1½" from the *outside* of the blade to serve as a stop, as



shown in Figure 3b. Then set the blade height to ½". Now cut a notch on each end of each rail.

The next step is cutting the rabbets to make the track that the saw rides on. These rabbets are cut on the opposite face from the notches. And you don't have to change the dado blade setup. As Figure 3c shows, all you need to do is attach a wood fence to the rip fence and "bury" part of the blade in it, leaving ½" of the blade exposed. Then lower the blade to cut a ¼"-deep rabbet.

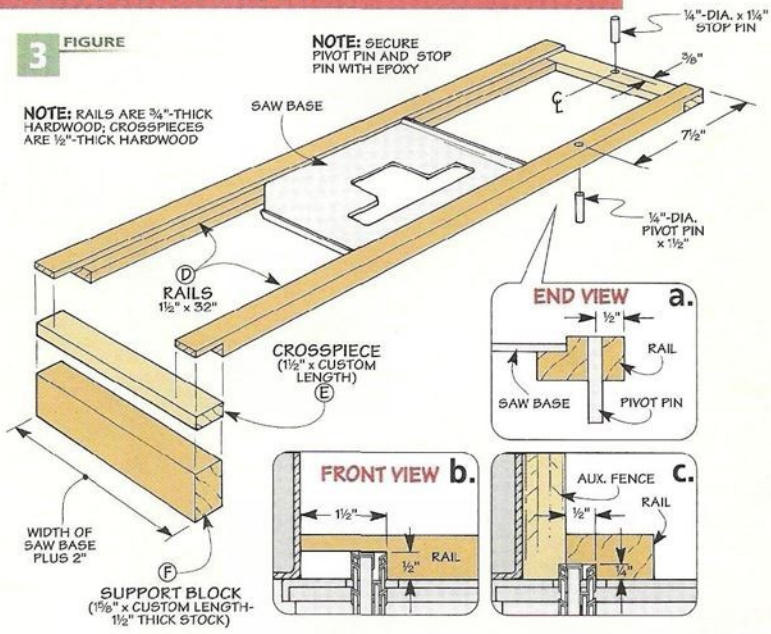
Crosspieces – With the rails complete, the next step is to add the two *crosspieces (E)*. The length of these pieces is determined by the width of the metal base of your saw. Simply measure the saw's base and add 2" to allow for the width of the rails. The crosspieces are ½" thick so that when they're glued into the notches in the rails, they sit flush with the bottom of the rails.

Before assembling the carriage, a couple of holes need to be drilled. Take a look at Figure 3 and you'll see that one hole is drilled through a crosspiece and the other is drilled through a rail. Later, steel pins are glued into each of these holes to serve as the carriage pivot pin and the stop for the saw.

Now you're ready to glue up the rails and crosspieces to make the saw carriage. The thing to be aware of here is the distance between the rails. The idea is to have the saw slide in the completed carriage with no "slop." An easy way to get this spacing is to clamp the rails around the base of the circular saw while the assembly dries.

Support Block – After the carriage has dried, a *support block (F)* is added under the undrilled crosspiece (Figure 1). This block supports the end of the carriage and keeps the carriage level when it's placed on the fence. The support block is the same width and length as the crosspiece.

FIGURE 3



To complete the carriage, all that's needed are the stop and pivot pins. These are cut from the unthreaded portions of a couple of bolts (see margin). Note that the pivot pin glued into the rail (Figure 1b) is longer than the stop pin glued into the crosspiece (Figure 1c). I filed a slight chamfer on each end of the pins to make it easier to fit the pins into the holes.

Cut Arc – After the pins are epoxied in place, you can trim the back edge of the platform to shape. (I did this to reduce the size and weight of the platform.) An easy way to lay out the arc is to use the saw carriage as a giant compass. To do this, simply hold a pencil at the left front corner of the carriage and swing the carriage from one side of the platform to the other, like you see in Figure 4. (Note: If your carriage pivots on the left rail, hold the pencil at the right front corner.)

Now set the carriage aside and use a jig saw to cut along the line. Some sanding will smooth the back edge. Then rout a 1/16" chamfer on the top of the curved edge.

▲ *Steel Pins. The pivot pin and the stop are cut from the unthreaded portion of a bolt.*

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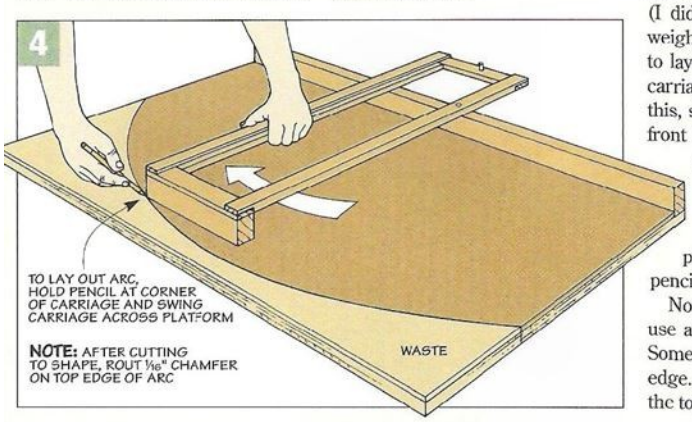


Stop System

The key to the precision of this project is the index holes that let you position and lock the carriage to make perfect 90° crosscuts and 45° miters every time. It's important that these holes are in exactly the right places. But don't worry. There's an easy way to make sure you drill them right where they should be.

Index Holes – I started by laying out the indexing holes at the 45° positions. If you look at Figure 6, you'll see that a combination square can be used to position the carriage at a 45° angle to the fence. Then clamp the carriage in place.

But I didn't trust my combination square to be exactly 45°. So before drilling the indexing hole, I thought it would be a good idea to check the position of the carriage to make sure it was dead-on.

To do this, place a piece of scrap on the platform and cut through the scrap. (See "Setup and Use" on the opposite page.) Then flip one piece of the scrap over as shown in Figure 6a, and place the mitered edges together. If the two pieces form a perfect 90° angle, the carriage is properly positioned. If the angle is off, nudge the carriage slightly and try the test again until you end up with an exact 90° angle. Then go ahead and drill the indexing hole, as shown in Figure 7.

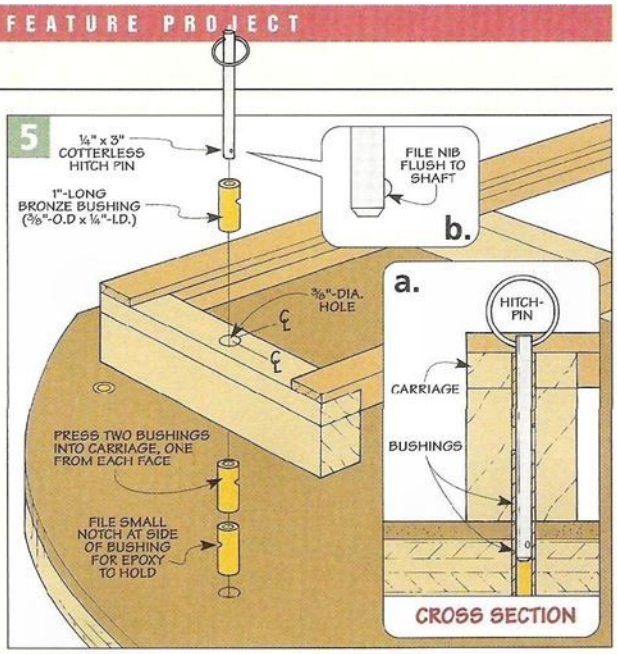
To locate the opposite 45° angle, simply repeat this process. Finally, use a try square to position the carriage for the 90° indexing hole.

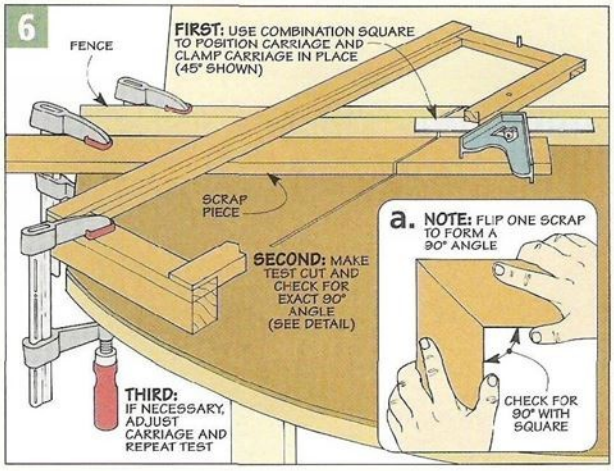
Note: If you think you'll be cutting other angles frequently, go ahead and drill holes for those angles.

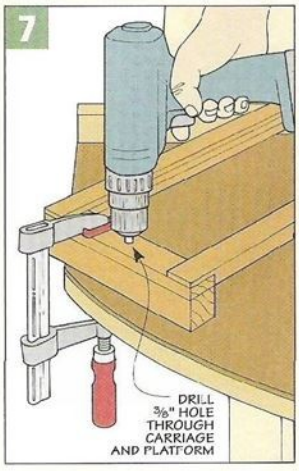
Bushings – The holes in the platform and saw carriage accept the index pin that locks the carriage in place (Figure 5). Moving this pin in and out repeatedly could enlarge the holes, so I lined the holes with bronze bushings.

The bushings I used were 1" long. However, the platform is just under 1" thick, so the bushings stick up above the surface slightly. A few strokes with a file on each bushing fixed that. Then the bushings are

▲ *Indexing System Hardware. A cotterless hitch pin that fits into bronze bushings forms a precise indexing system.*







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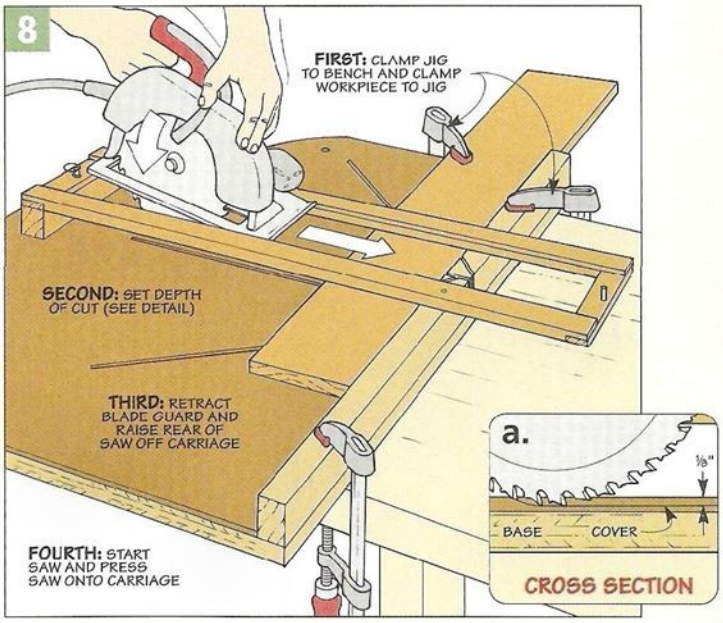
secured in the holes with epoxy. (Note: Remove the hardboard cover first to avoid gluing it to the base.)

On the carriage, I pressed in a bushing from each face (Figure 5).

There's also some quick filing that needs to be done on the index pin. If you look at Figure 5b, you'll see that a small spring-loaded nib sticks out from one side of the pin. I filed this nib flush with the shaft of the pin to make it easy to get the pin in and out.

SETUP AND USE

Using the miter station is easy. You'll want to clamp it to your bench or a pair of sawhorses to keep it stable, as shown in Figure 8. (See the photo below for a way to clamp it in a portable workbench.) Then clamp your workpiece to the miter station platform to keep it from shifting during the cut. And like you see in Figure 8a, set the blade depth to cut just 1/8" into the hardboard cover.



To make a cut, place the saw in the carriage and retract the blade guard slightly. Before turning the saw on, raise the rear of the saw to lift the blade off the cover, as shown in Figure 8. (This keeps the saw from lurching back when you turn it on.) Now just squeeze the trigger, lower the saw onto the carriage, and push the saw along to the stop pin.

Safety Note: When you reach the end of the cut, let the saw blade stop rotating before lifting the saw from the carriage. Otherwise, the blade may bind in the fence and kick back.

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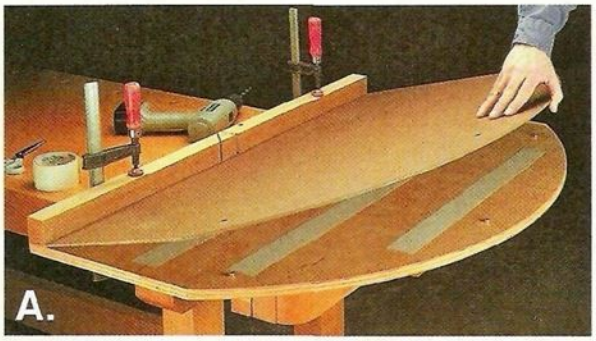
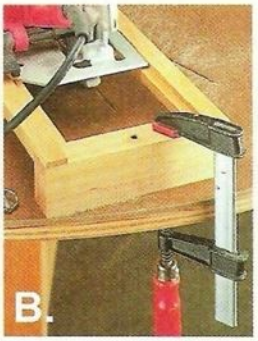
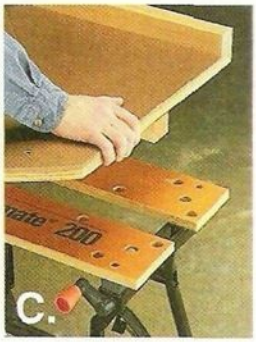
Other Features

Here are some tips to help you get the most from your miter station.

Replaceable Cover – The hardboard cover is held on with carpet tape so that it can be replaced if it gets chewed up over time.

The old cover can be used as a template to lay out the shape of the new cover and the location of the indexing holes. Cut the new cover to size, put fresh carpet tape on the base and press the cover in place, like you see in photo A.

Other Angles – You can use the miter station to cut any angle between 45° and 90° by simply clamping the carriage in the desired position, as shown in photo B.

Clamping Cleat – Portability is a great feature of the miter station. Photo C shows how a cleat screwed to the bottom of the platform allows you to clamp the station in the jaws of a portable workbench.